JAPAN

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JIS D 9401 (2010) (English): Frame -- Assembly for bicycles

安 *The citizens of a nation must honor the laws of the land.* 倂

Fukuzawa Yukichi

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Frame—Assembly for bicycles

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Bicycle Promotion Institute (JBPI)/ Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS D 9401**:2005 is replaced with this Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Frame—Assembly for bicycles

Introduction

This Japanese Industrial Standard was established in 1963 and has gone through 10 revisions to this day. The last revision was made in 2005, and this revision has been made so as to include requirements for motor assist cycles and carbon fiber frames.

The corresponding International Standard has not yet been published at this moment.

1 Scope

This Standard specifies frame-fork assemblies to be used for bicycles for general use, bicycles for young children and motor assist cycles specified in **JIS D 9111** (hereafter referred to as "frame-fork assembly"). This Standard does not apply to frame-fork assemblies used for tricycles in the category of motor assist cycles. However, the test procedures specified in this Standard may be applied, using necessary jigs, to frame-fork assemblies for tricycles in the category of motor assist cycles with respect to the frame strength.

For those frames having a swing mechanism, each test shall be performed with the swing mechanism being locked.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0205-1 *ISO general purpose metric screw threads—Part 1: Basic profile*

JIS B 0205-2 *ISO general purpose metric screw threads—Part 2: General plan*

JIS B 0205-3 *ISO general purpose metric screw threads—Part 3: Selected sizes for screws, bolts and nuts*

JIS B 0205-4 *ISO general purpose metric screw threads—Part 4: Basic dimensions*

JIS B 0209-1 *ISO general purpose metric screw threads—Tolerances—Part 1: Principles and basic data*

JIS B 0209-2 *ISO general purpose metric screw threads—Tolerances—Part 2: Limits of sizes for general purpose external and internal screw threads—Medium quality*

JIS B 0209-3 *ISO general purpose metric screw threads—Tolerances—Part 3: Deviations for constructional screw threads*

JIS B 0225 *Cycle threads*

JIS B 1501 *Rolling bearings—Balls*

JIS D 0202 *General rules of coating films for automobile parts*

JIS D 9101 *Cycles—Terminology*

JIS D 9111 *Cycles—Classification and essential characteristics*

JIS D 9402 *Bicycles—Front forks*

JIS D 9418 *Bicycles—Free wheels and hub cogs*

JIS H 8617 *Electroplated coatings of nickel and chromium*

JIS Z 2245 *Rockwell hardness test—Test method*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS D 9101** and the following apply.

3.1 frame central plane

plane determined by the centrelines of the head tube, top tube, seat tube, down tube, or members corresponding thereto

Practically, this plane should be considered as a plane made by the centres of the internal diameter at both ends of head tube and a point nearby the bottom bracket joint on the centreline either of the seat or down tube or a member corresponding thereto.

3.2 frame size

distance from the centre of the bottom bracket spindle to the upper extreme of the seat tube or a member corresponding thereto (see figure 1)

3.3 frame parts

generic term of head set, bottom bracket parts and seat parts

3.4 rigid fork

front fork having high rigidity for testing, which is fitted to a frame

4 Constitution and classification

4.1 Constitution

Frame-fork assemblies shall consist of frame, front fork and frame parts, shall be as shown in figure 1 and table 1.

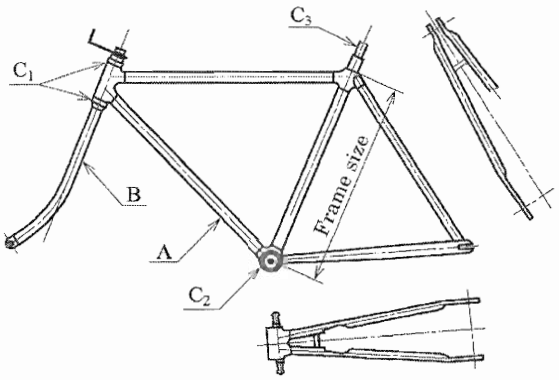


Figure 1 Constitution of frame-fork assembly

Table 1 Constitution of frame-fork assembles

Division of constitution			Symbol in figure 1
Frame-fork assembly	Frame		A
	Front fork		B
	Frame parts	Head set	C_1
		Bottom bracket parts	C_2
		Seat parts [a]	C_3
Note [a] Seat parts may be omitted from the frame-fork assembly.			

4.2 Classification

Frame-fork assemblies are classified according to the type of the bicycle to which they are applied, usage and shape, and are as follows.

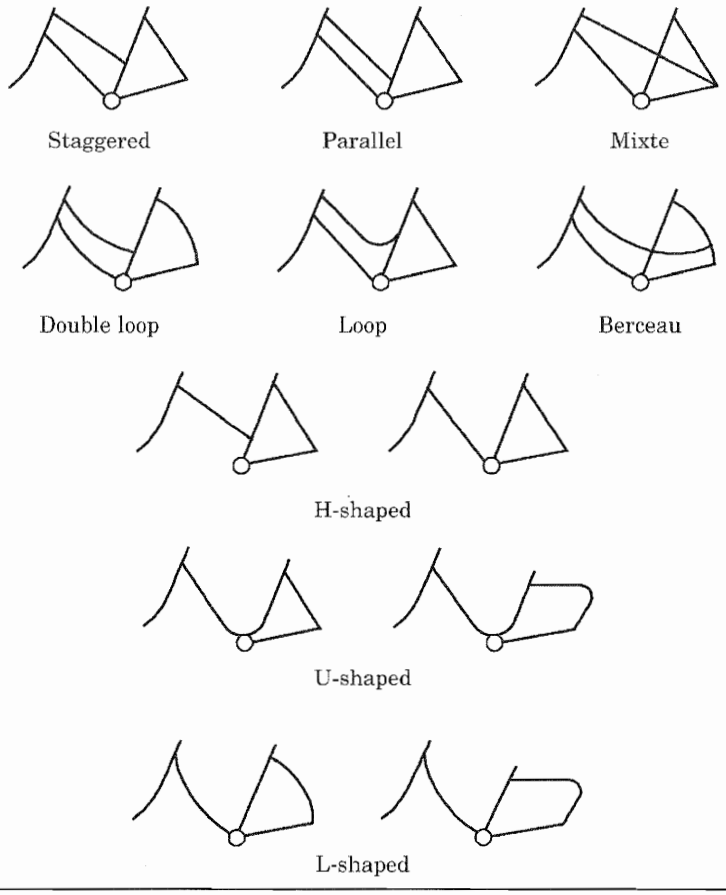
a) **Classification of frame-fork assemblies by the type of bicycles to which they are applied and by usage** The classification of frame-fork assemblies by the type of bicycles to which they are applied and by usage are as shown in table 2.

Table 2 Classification of frame-fork assemblies by the type of bicycles to which they are applied and by usage

Type	Usage	Bicycle models
Bicycles for general use	For adults	Sport bicycles (including MTB-look bicycles)
		City-cycles
		Compact bicycles
		Utility bicycles
	For children	Children bicycles
Bicycles for young children	For young children	Bicycles for young children
Motor assist cycles	For adults	Sport bicycles (including MTB-look bicycles)
		City-cycles
		Compact bicycles
		Utility bicycles

b) **Classification of frame-fork assemblies by shape** For classification of shape, frame-fork assemblies are either diamond-shaped or other than diamond-shaped, as exemplified in table 3.

Table 3 Shapes of frame-fork assembly

Shape	Example of shape of frame-fork assembly
Diamond-shaped	
Other than diamond-shaped	 Staggered Parallel Mixte Double loop Loop Berceau H-shaped U-shaped L-shaped

5 Names of parts

The names of parts of frame are shown in figure 19.

The names of parts of front fork shall be in accordance with **JIS D 9402**. The names of parts of head set, bottom bracket parts and seat parts shall be in accordance with figures 20 to 22.

6 Construction

6.1 Frame-fork assembly

Frame-fork assemblies shall be constructed as follows:

a) The tubes and lugs of frame, adjacent tubes of frame fork, and required fittings, etc. shall be jointed securely by brazing, welding or other method.

b) Each wheel attachment part of both rear fork ends shall be parallel to the frame central plane.

c) The centrelines of mudguard and caliper brake attachment holes shall lie on the frame central plane.

d) The bottom bracket fixed cup shall be of left-hand screw thread. For those provided with locking device, right-hand thread may also be used.

e) The bottom bracket spindle shall be installed at right angles to the frame central plane.

Further, radial run-out at the bottom bracket spindle right end shall not exceed 0.5 mm.

f) The seat pillar shall be capable of being securely fixed[1)] by tightening the seat clamping bolt or the like, and of sliding up and down easily when fixation is released by loosening the fixing means such as a seat clamping.

Note [1)] The seat pillar is regarded as "securely fixed" if, when a load is applied to a saddle, which is expected to be used and fitted to the seat pillar, in the same manner as specified for the saddle fixing performance in **JIS D 9301** or **JIS D 9302**, there is no relative movement between the seat pillar and the frame-fork assembly.

g) The rotational structure of head and bottom bracket assembly shall run smoothly without visible play.

h) The frame-fork assembly shall be given plating, painting or other suitable surface treatments, except where the material used is corrosion resistant.

6.2 Folding or dividing structured frame

The folding or dividing structure of the frame shall be as follows:

a) Frame fastening metal using a quick release device or other mechanisms shall be securely fixed by means of a multiple structure[2)], and shall be free from looseness or visible play during running of the bicycle.

Note [2)] Mechanism which can be deactivated by an operation consisting of two or more actions

6.3 Front fork

The construction and shape of front fork shall be as specified in **JIS D 9402**, or at least equivalent thereto in quality.

6.4 Frame parts

The frame parts shall be constructed as follows:

a) The phase difference between both square tapered faces shall not exceed 2°.

b) Where steel balls are used for the frame parts, these shall be in accordance with **JIS B 1501** or Annex B of **JIS D 9418**.

Any steel ball retainer, if used, shall not obstruct the function of steel balls and shall allow the bearing assembly to rotate smoothly.

7 Performance

7.1 Frame-fork assembly

7.1.1 Durability of frame-fork assembly

A frame-fork assembly, when subjected to the vibration test of **9.1.1 a**) or the fatigue test of **9.1.1 b**), shall be free from fracture, visible deformation, and distortion on any of its parts.

When a frame-fork assembly made of carbon fiber is subjected to a fatigue test of **9.1.1 b**), the maximum deflection during the test at the point where the force (F) is applied as specified in **9.1.1 b**) **6**) shall not increase by 20 % or more from the initial value.

7.1.2 Impact resistance or energy absorbing property

When a frame-fork assembly is subjected to the following impact test in **9.1.2 a**) or the energy absorption test in **9.1.2 b**), the permanent deformation of distance between both axle centrelines (wheel base) shall not exceed 40 mm (20 mm for those for bicycles for young children), and there shall be no visible fracture on any of its parts.

The maximum value of the force used in the energy absorption test in which the frame-fork assembly is made to absorb energy shall be 880 N or more.

7.1.3 Falling frame-fork assembly impact resistance

When frame-fork assemblies for adult bicycles, children bicycles and bicycles for young children are subjected to the falling frame-fork assembly impact resistance test in **9.1.3 a**), there shall be no visible fracture on any of their parts. When frame-assemblies for MTB-look bicycles are subjected to the falling frame-fork assembly impact resistance test of **9.1.3 b**), there shall be no visible fracture on any of their parts. Furthermore, the permanent wheel base deformation shall not exceed 60 mm.

7.2 Frame parts

7.2.1 Strength of head set

The upper head cup, lower head cup and crown race shall not fracture when a force is applied gently onto both ends through the diameter to compress the internal diameter by 3 %.

7.2.2 Strength of bottom bracket parts

When a bottom bracket spindle is subjected to the test of **9.2.1**, the breaking force shall not be less than 20 kN, and the product of the force (kN) and the deflection at the centre of the spindle (mm) shall not be less than 30 N · m.

If the bottom bracket spindle constitutes a part of the auxiliary driving power unit of a motor assist cycle, this test shall not apply.

7.2.3 Hardness of ball race surfaces of head set and bottom bracket parts

The hardness of the ball race surface of head set and bottom bracket parts, when tested according to **9.2.2**, shall be as given in table 4.

Table 4 Hardness of ball race surfaces of head set and bottom bracket parts

Parts	Hardness
Upper and lower head cups, head cone and crown race	73 HRA min.
Bottom bracket fixed cup and adjusting cup	77 HRA min.
Bottom bracket spindle	52 HRC min.

7.2.4 Strength of seat pillar

The seat pillar, when tested by the method in **9.3.1** or **9.3.2**, shall be free from any fracture or visible cracks.

Combined seat pillars for MTB-look bicycles shall be tested in accordance with **9.3.2**.

8 Dimensions

Dimensions of frame-fork assembly and frame parts shall generally be as given in figures 19 to 22, and further be according to the following:

Dimensions without indicated tolerances are recommended dimensions.

8.1 Frame-fork assembly

a) Deviation of centre of the top extreme of the seat tube or a corresponding member from the frame central plane shall not exceed 2 mm.

b) Deviation of centre of inside interval between the rear fork ends from the frame central plane shall not exceed 3 mm.

c) Centre of inside interval between the chainstays at 50 mm backward from the bridge or at the point where rim passes through shall be within a range of 2 mm from the frame central plane, and further, the deviation from the centering position of inside interval between the rear fork ends **b**) shall not exceed 1.5 mm.

d) The misalignment between the left-hand and right-hand rear slots shall not exceed 1 mm when viewed at right angles to the frame central plane and measured on a plane parallel to the frame central plane (see figure 2).

Unit: mm

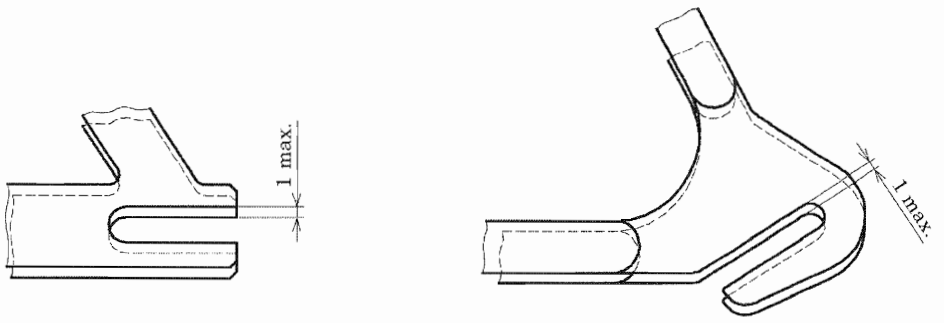


Figure 2 Misalignment of rear fork end slots

e) Threads shall be in accordance with the specifications in **JIS B 0225**. Threads conforming to the specifications in **JIS B 0205-1** to **JIS B 0205-4** may also be used. The limits of size and tolerances shall conform to the tolerance zone class 6H/6g as specified by **JIS B 0209-1** to **JIS B 0209-3** or better classes.

8.2 Frame parts

The runout of bottom bracket spindle, when measured as specified in **9.2.3**, shall be such that the radial runout at the gauge periphery and the axial runout at 25 mm from the centre of gauge circumference shall not exceed 0.3 mm, respectively.

9 Test method

9.1 Strength test of frame-fork assembly

9.1.1 Vibration test of frame-fork assembly

a) **Vibration test** The vibration test shall be as follows:

1) With a frame-fork assembly mounted on the stand so as the ground contact points of both intended wheels are horizontal as shown in figure 3, the test shall be made by application of vertical up-and-downward vibrations under the conditions given in table 5.

   The front wheel attachment part shall be freely movable in the lengthwise orientation.

2) Using a seat pillar to be combined with the frame-fork assembly, fix the seat pillar at the position of the minimum insertion mark. Secure the saddle-shaped weight support as shown in figure 4 onto the seat area and suspend the circular weights dividedly on both sides through the hanger metals so that the total mass of the weight support, hanger metals, and weights is applied to the seat assembly. The weight support shall be secured to the seat pillar on the axis at 20 mm below the upper extreme of the pillar by using a fastening metal. For a frame-fork assembly using a combined seat pillar, the test may be performed by replacing the combined seat pillar with a unit pillar having the same length. If the bar connecting the right-hand and left-hand weights contacts with the battery or other parts, test shall be performed with the connecting bar removed.

3) For applying load to the bottom bracket assembly, fix circular weight to the bottom bracket area dividedly on both sides.

   The weight support to which the weight is fixed shall not be heavier than 2 kg.

4) For applying load to the head assembly, fix the weight at the position where there is no clearance between the under surface of the weight support (of mass not more than 0.5 kg) and the upper surface of the head lock nut by using a metal fitting as shown in figure 5. For a frame-fork assembly using a handlebar stem consisting of a stem only, in which the fork stem is clamped from outside, the test shall be performed with the weight fixed to the upper end of the fork stem by means of a jig which clamps the fork stem from outside or by means of the handlebar stem.

5) The frequency of vibration shall be selected arbitrarily in the range of 5 Hz to 12 Hz avoiding a resonance frequency.

6) For testing a frame-fork assembly for motor assist cycles, fix the battery, the drive unit, control unit, or other parts that are to be mounted under the test conditions in table 5, or weights of equivalent masses thereof, on positions where they are actually mounted so that the test assembly simulates the actual application of load on the frame-fork assembly. In this case, the battery, drive unit and control unit themselves are not the subjects of evaluation for the vibration proof performance. When the drive unit housing or other parts of the frame-fork assembly for motor assist cycles constitute a part of the frame-fork assembly, the test shall be performed with all such parts being attached.

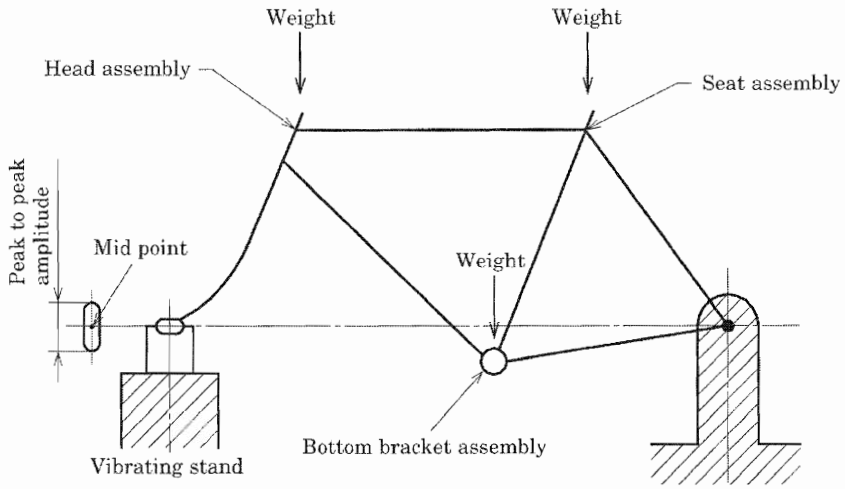


Figure 3 Vibration test of frame-fork assembly

Table 5 Test conditions for vibration test of frame-fork assembly

Type of frame-fork assembly		Weight (mass) kg				Frequency of vibration Hz	Acceleration of vibrating part m/s^2	Number of vibrations
		Head assembly	Seat assembly	Bottom bracket assembly	Total			
For adults	Diamond-shaped	5	50	20	75	5 to 12	19.6	100 000
	Other shapes		45	15	65		17.6	70 000
For children			40	10	55			
For young children			30	10	45		15.7	40 000
MTB-look		10	50	25	85		22.0	150 000

Unit: mm

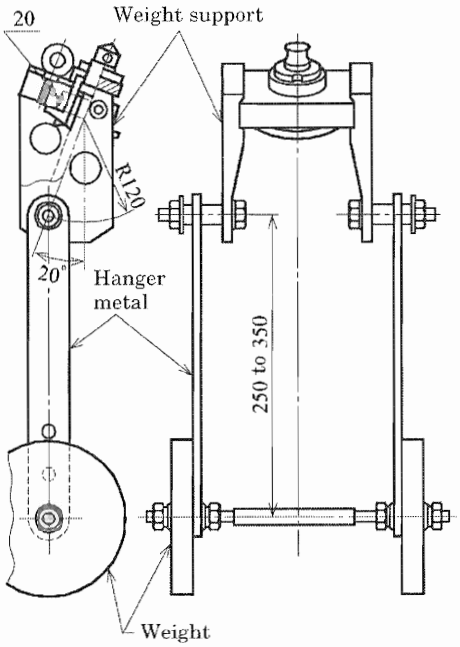


Figure 4 Weight installation jig to seat assembly

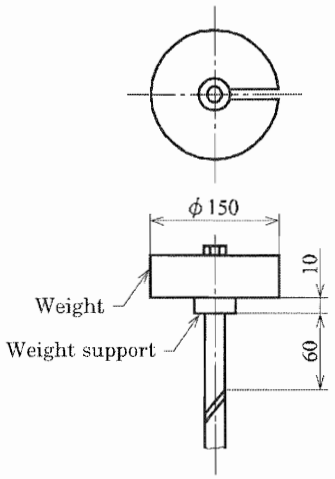


Figure 5 Weight installation jig to head assembly

b) **Fatigue test**

1) With the front fork allowed to be turning in the head assembly, fix the frame-fork assembly on a test stand as shown in figure 6. The rear axle, in such a way that the frame can rotate about it, shall be fixed uppermost of the prop having a length equal to the radius of the intended wheel $R_W \pm 30$ mm.

The supporting end of the prop shall comprise a spherical joint which can rotate in any direction. The front axle, in such a way that the fork can rotate about it, shall be fixed to attain the state of **2**).

2) The frame-fork assembly shall be mounted so that the front and rear axles are aligned on a horizontal line. Frame-fork assemblies of a design in which the nominal diameters of front and rear wheels are different shall be installed so that the contact point of each wheel is horizontal.

3) In the test, the front fork may be replaced with a rigid fork so that there is no variation in the head height.

When the front fork is used for the test, fracture of the front fork shall not be the subject of evaluation for the fatigue test.

4) Replace the crank with the boomerang-shaped adaptors (see figure 7) connected with a test spindle being free to rotate in the bottom bracket assembly for the cranks-spindle assembly. Both adaptors shall be fixed at an angle of $45° \pm 2°$ downward. The length, L, between the test spindle and the test pedal shaft to be fitted shall be adjusted to be equal to the crank length intended.

5) The boomerang adaptors shall be fixed through the lever arm taking the place of a chainwheel and connecting rod taking the place of a chain. The connecting rod shall be installed between a portion 75 mm above the centre of test spindle and the rear axle attachment point. A curved connecting rod may be used in the case the connecting rod contacts with the frame-fork assembly.

6) Apply a downward force F of 850 N (or 500 N for those for children bicycles or bicycles for young children) with an inclination toward inside the frame of an angle of $7.5° \pm 0.5°$ for 100 000 cycles.

The force shall be applied onto each test pedal shaft alternately at a portion of 150 mm $\pm$ 1.5 mm from the frame central plane.

7) In the case of a carbon fiber frame, a deflection shall be measured during the test at the position where the force (F) is applied in **6**) above.

8) In the case of a frame-fork assembly for motor assist cycles in which the drive unit housing or other parts constitute a part of the assembly, the test shall be performed with such parts being attached.

Unit: mm

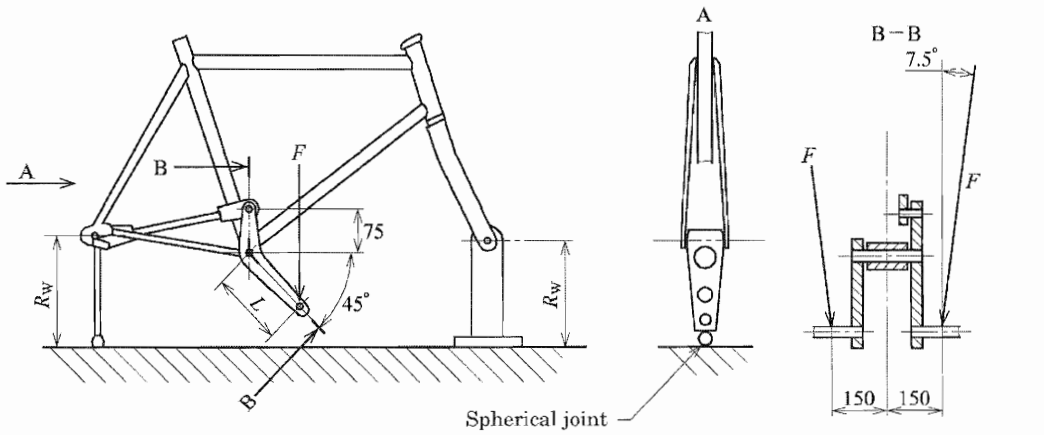


Figure 6 Fatigue test of frame-fork assembly

Unit: mm

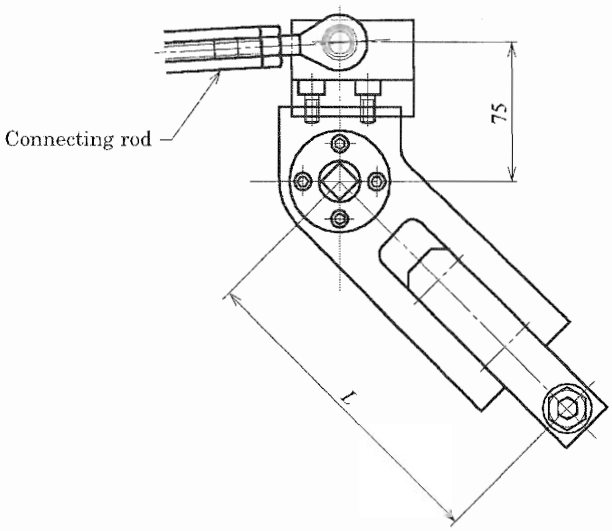


Figure 7 Example of boomerang adaptor

9.1.2 Impact resistance or energy absorbing property

a) **Falling mass impact test** Attach a low-mass roller of not more than 1 kg onto the front fork of the frame-fork assembly and holding the assembly vertical, clamp to a rigid fixture at the rear axle attachment point as shown in figure 8. Drop a weight of 22.5 kg vertically through a height of 180 mm (or 50 mm for those for bicycles for young children) so as to strike the low-mass roller in the front axle attachment part at a point in line with both wheel centres. Compare the wheel bases measured before and after test to determine the permanent deformation.

Where the frame has detachable or movable top tube, it shall be tested with the top tube removed or converted to the downward attachment. In the case of a frame-fork assembly for motor assist cycles in which the drive unit housing or other parts constitute a part of the assembly, the test shall be performed with such parts being attached.

Unit: mm

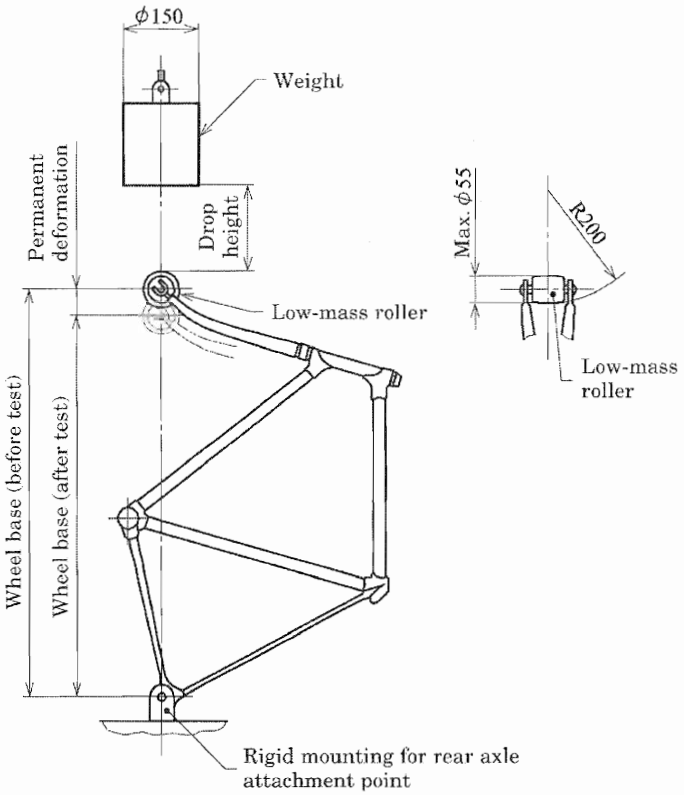


Figure 8 Frame-fork assembly falling mass impact test

b) **Energy absorption test** Attach a low-mass roller of not more than 1 kg onto the front fork of the frame-fork assembly and holding the assembly vertical, clamp to a rigid fixture at the rear axle attachment point as shown in figure 9. Apply a force on the low-mass roller in the front axle attachment part in the direction of the rear axle to let the assembly absorb the energy of 40 J (or 11 J for those for bicycles for young children) and compare the wheel bases measured before and after test to determine the permanent deformation. Also, measure the maximum force applied during this procedure.

In the case of a frame-fork assembly for motor assist cycles in which the drive unit housing or other parts constitute a part of the assembly, the test shall be performed with such parts being attached.

Unit: mm

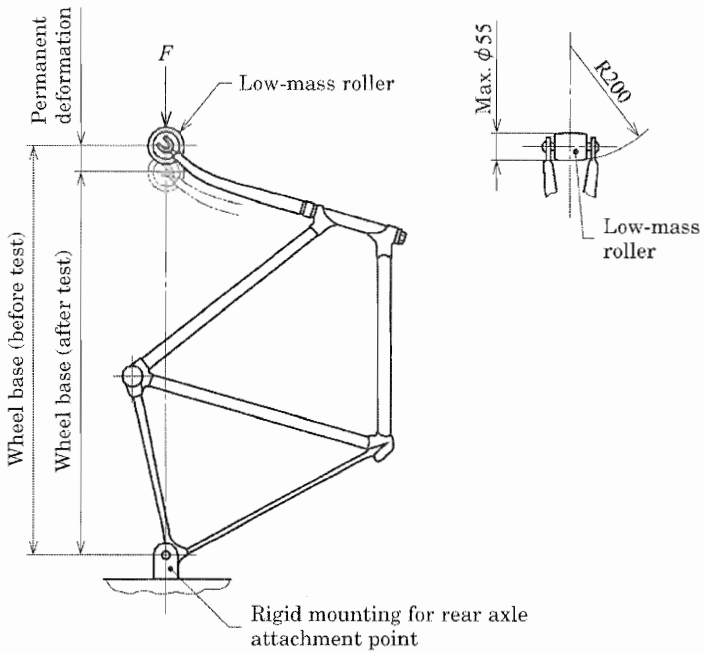


Figure 9 Frame-fork assembly energy absorption test

9.1.3 Falling frame-fork assembly impact resistance

a) **Falling frame-fork assembly impact test** Attach a low-mass roller onto the frame-fork assembly used for the test of **9.1.2 a)** or **9.1.2 b)**, and mount the assembly on a fixture so that it is free to rotate about the rear axle attachment axis in a vertical plane as shown in figure 10. And then, with the front fork being supported by a flat steel anvil such that the front and rear wheel axles are in the horizontal, and fix a weight (an example of the shapes and dimensions of the weight and the weight support is shown in figure 11) of 70 kg (30 kg for those for bicycles for young children) so that its centre of gravity is on extension of axis of, and 75 mm from the top face of the seat tube.

The mass of weight support shall be not more than 2 kg.

For testing a frame-fork assembly for motor assist cycles, fix the battery, the drive unit, control unit, or other parts that are to be mounted on the frame, or weights of equivalent masses thereof, on positions where they are actually mounted so that the test assembly simulates the actual application of load on the frame-fork assembly. In this case, the battery, drive unit and control unit themselves are not the subjects of evaluation for the falling frame-fork assembly impact test. When the drive unit housing or other parts of the frame-fork assembly for motor assist cycles constitute a part of the frame-fork assembly, the test shall be performed with all such parts being attached.

With the assembly under the above condition, raise it until the front fork ends are at 300 mm height from the anvil (250 mm for adult bicycles other than diamond-shaped, and for children bicycles and bicycles for young children) and then let it drop onto the anvil repeatedly twice to see if there is any visible fracture on

any part. If the centre of gravity of the weight has reached the vertical line above the rear axle, the falling height shall be the height at this point.

Unit: mm

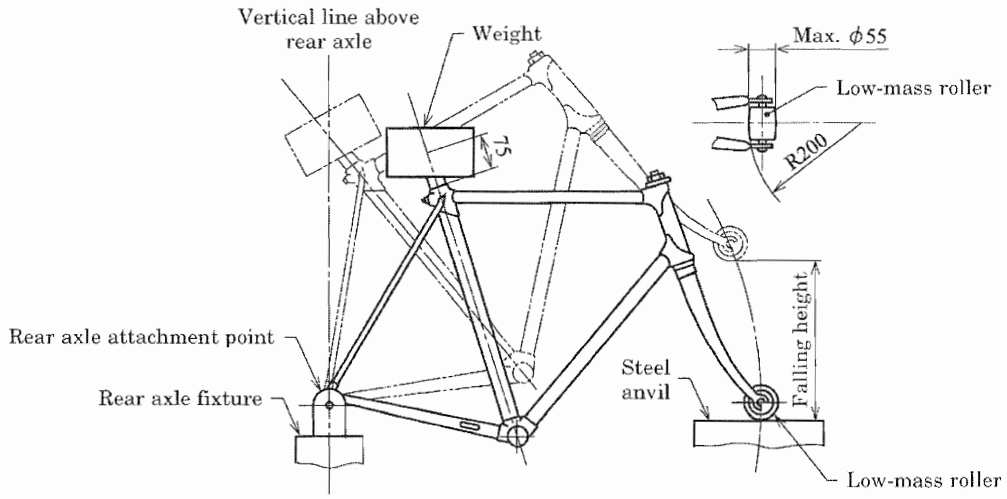


Figure 10 Falling frame-fork assembly impact test

Unit: mm

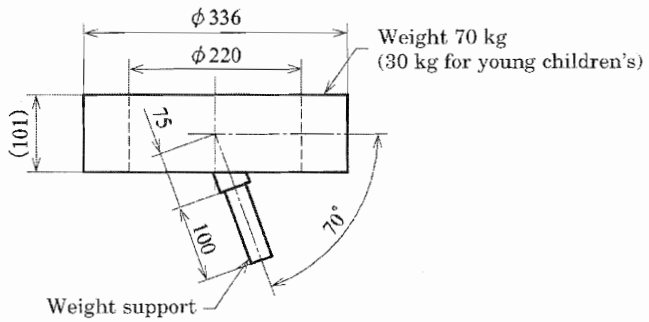


Figure 11 Weight (example)

b) **Falling frame-fork assembly for MTB-look bicycle impact test** Attach a low-mass roller onto the frame-fork assembly used for the test of **9.1.2 a**) or **9.1.2 b**), and mount the assembly on a fixture so that it is free to rotate about the rear axle attachment axis in a vertical plane as shown in figure 12. And then, with the front fork being supported by a flat steel anvil such that the front and rear wheel axles are in the horizontal, and fix a weight of 5 kg on the head assembly, a weight of 35 kg on the bottom bracket assembly, and a weight of 30 kg on the seat assembly so that its centre of gravity is on extension of axis of, and 75 mm from the top face of the seat tube (an example of the shape and dimensions of the weight is shown in figure 13).

Mass of the weight support to which a weight is attached shall be 0.5 kg max. for the head assembly and 2 kg max. for each of the seat assembly and the bottom bracket assembly.

For testing a frame-fork assembly for motor assist cycles, fix the battery, the drive unit, control unit, or other parts, or weights of equivalent masses thereof, on positions where they are actually mounted so that the test assembly simulates the actual application of load on the frame-fork assembly. In this case, the battery, drive unit and control unit themselves are not the subjects of evaluation for the falling frame-fork assembly impact test. When the drive unit housing or other parts of the frame-fork assembly for motor assist cycles constitute a part of the frame-fork assembly, the test shall be performed with all such parts being attached.

With the assembly under the above condition, raise it by the front fork ends to the falling height of 300 mm from the anvil (if the centre of gravity of the weight has reached the vertical line above the rear axle, the falling height shall be the height at this point) and then let it drop onto the anvil repeatedly twice to see if there is any visible fracture on any part. Compare the wheel bases measured before and after test to determine the permanent deformation.

Unit: mm

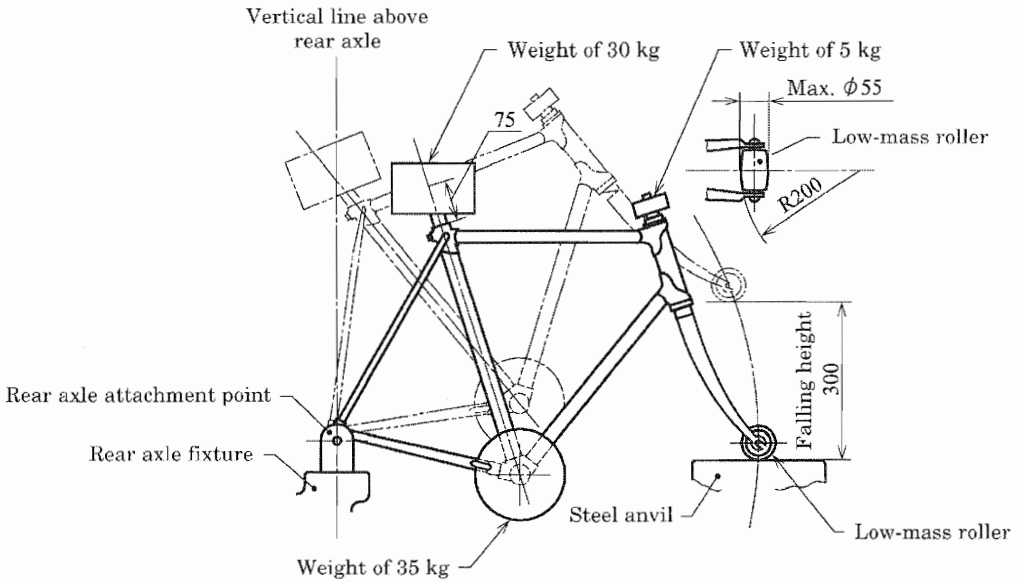
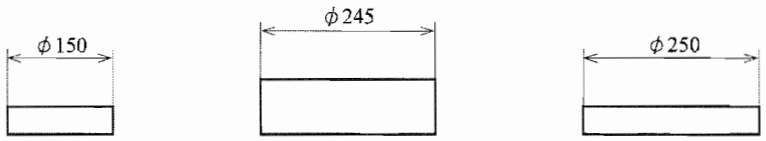


Figure 12 Falling frame-fork assembly for MTB-look bicycle impact test

Unit: mm



a) For head (5 kg) **b) For seat (30 kg)** **c) For bottom (17.5 kg × 2)**

Figure 13 Weights (example)

9.2 Strength test of frame parts

9.2.1 Strength test of bottom bracket spindle

Apply a force onto a bottom bracket spindle as shown in figure 14 until it breaks, and determine the breaking force as well as the product of the breaking force (kN) and the deflection at the centre of the spindle (mm).

Unit: mm

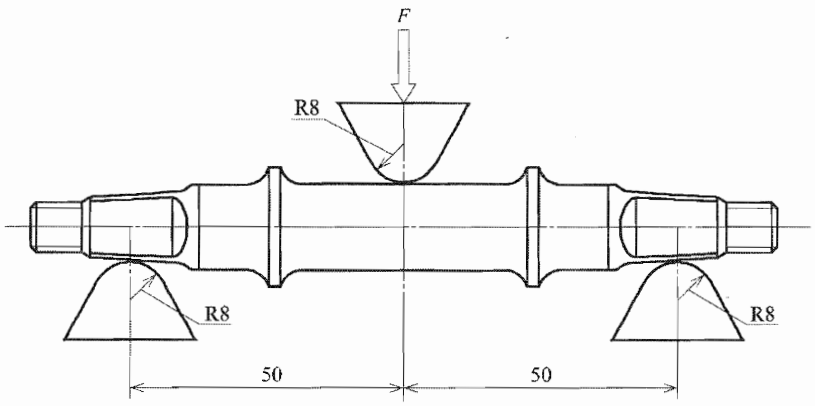


Figure 14 Strength test of bottom bracket spindle

9.2.2 Hardness of ball race surfaces of head set and bottom bracket parts

Measure the hardness of the ball race surfaces of head set and bottom bracket parts by the test method specified in **JIS Z 2245**.

9.2.3 Runout of bottom bracket spindle

For the runout of the bottom bracket spindle, with the spindle assembled within the test bottom bracket unit as shown in figure 15, measure the radial runout at the periphery of the gauge of 55 mm in outer diameter fitted onto the spindle end on the chainwheel side as well as the axial runout at the outer face of the gauge at 25 mm from the centre of the gauge.

Unit: mm

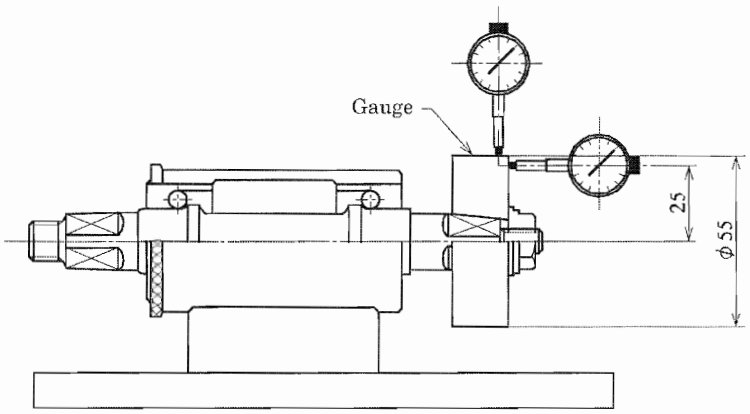


Figure 15 Runout on bottom bracket spindle

9.3 Fatigue test on seat pillar

9.3.1 Fatigue test on seat pillar 1

Fatigue test on seat pillar 1 shall be performed as follows, and then the seat pillar shall be examined for fracture and visible cracks.

a) Insert the test subject, in the fully-finished state, into a fixture representative of a bicycle seat cluster to the minimum insertion depth and clamp it by means of the usual fastening metal. The axis of the seat pillar shall be inclined through 73° to the horizontal (see figures 16 and 17).

b) **Position and directions of test forces** The seat pillar shall be subjected to two stages of dynamic force. The respective directions of test force are as shown in figures 16 and 17.

In the first stage, apply a repeated, vertical down force, F_4, alternately to each end of a suitable test adaptor which represents a saddle and which is securely clamped to the seat pillar (see figure 16).

The adaptor shall be clamped to the top portion where the saddle clamp would fit, and the mid-span of the adaptor shall be located in the clamp bolt portion. The test forces shall be applied each 70 mm ahead and rear, respectively, of the midspan. If impossible to apply a force to the point of 70 mm, any correlative adjustment of the force with distance is permitted. For a seat pillar with a choice of horizontal positions for the clamp, the adaptor shall be located in the rearmost position.

In the second stage, apply a repeated rearward force, F_5, at 90° to the main axis of the pillar. For a straight pillar, apply the force through the centre of that position of the tube intended for the saddle clamp. For a seat pillar with a horizontal extension, apply the force through the intersection of the axes of the main tube and the extension.

c) **Test forces, number of test cycles and test vibration frequency** The test forces are given in table 6. In each stage, apply test forces for 50 000 cycles. One test cycle represents application of two alternating forces in the first stage, and application of single force in the second stage. The test vibration frequency shall not exceed 25 Hz.

Table 6 Condition of repeated force application

Material	Test force N	
	F_4	F_5
Ferrous [a]	850	650
Non-ferrous [b]	1 200	900

Notes [a] Seat pillars which are composed of ferrous materials except for bonding materials such as brazing materials and adhesives.

[b] In addition to bonding materials, seat pillars which use non-ferrous constituents and/or ferrous and non-ferrous composite metals shall all be classified as non-ferrous.

d) **Accuracy of test forces** Applied forces shall be accurate to within (0 to +5) % of the specified values.

Unit: mm

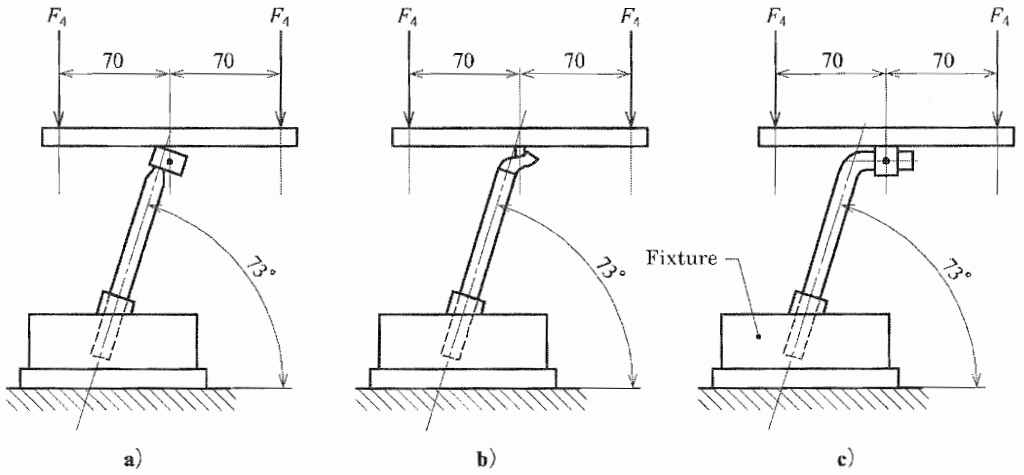


Figure 16 Seat pillar test, in the first stage

Unit: mm

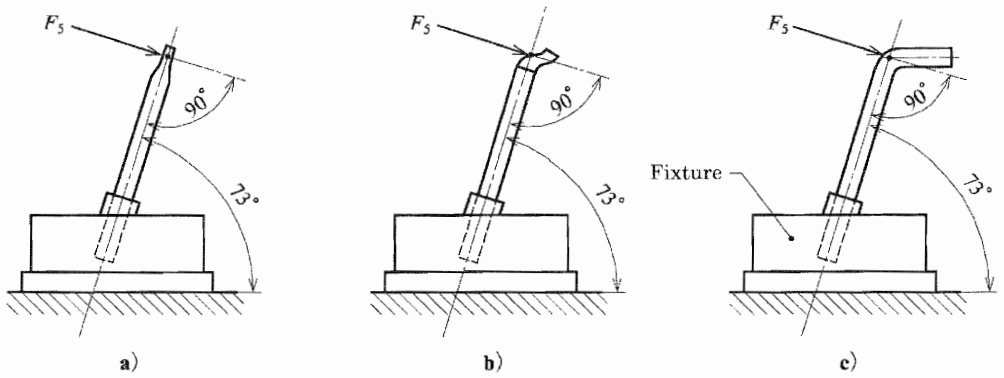


Figure 17 Seat pillar test, in the second stage

9.3.2 Fatigue test on seat pillar 2 (for combination seat pillar)

With the seat pillar fixed at the position of the minimum insertion mark with an inclination angle of 73° as shown in figure 18, attach a loading bar onto the saddle fitting part and tighten the seat pillar adjusting bolt to a torque of 30 N · m. Apply an alternate force of 200 N each upwards and downwards onto the points A and B of the testing bar at the test vibration frequency of 1 Hz for 200 000 cycles, and then examine for any fractures or visible cracks.

The accuracy of the applied forces shall be as defined in **9.3.1 d**).

Unit: mm

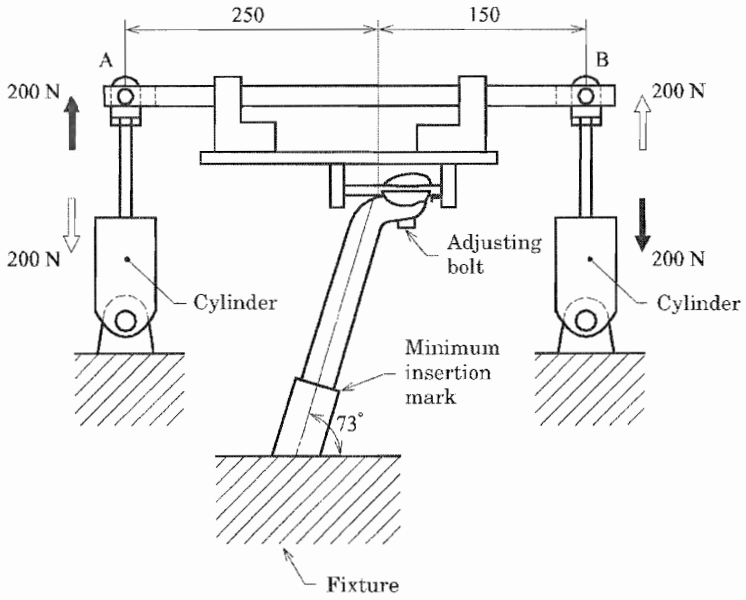


Figure 18 Fatigue test on seat pillar 2 (for combination seat pillar)

10 Plating and painting

10.1 Plating

The thickness and corrosion resistance of plating on the frame-fork assembly shall be Grade 3 of table 1 and table 2 specified in **JIS H 8617** or superior. This does not apply to corners, threaded portions and parts processed after plating.

10.2 Painting

The painted surfaces shall be as follows:

a) When tested by pencil scratch test using a pencil of lead type F according to the specifications of **JIS D 0202**, there shall be no breakage of paint film on tested surface.

b) When a steel ball of ball size 1/2 specified in **JIS B 1501** is dropped from a height of 1 500 mm vertically onto the paint coated film, there shall be no peeling, cracking or the like on the impacted surfaces.

11 Appearance

Appearance of frame-fork assembly shall be as follows:

a) There shall be no visible flaws, exposure or incomplete polishing of substrate, peeling, rust or other visible defects on the surfaces subjected to plating or painting.

b) Unplated or unpainted surfaces shall be free from rust, cracks, visible flaws or other visible defects.

c) There shall be no sharp edges, visible fins, burrs or the like on any part.

d) Marks shall be free from incomplete stamping, positional deviation, irregular colour, blur, and other visible defects.

12 Designation of products

The products shall be designated by the number of this Standard or "Frame—Assembly for bicycles" (name), classification of bicycles and use or type.

Example 1 **JIS D 9401** Bicycle for general use Bicycle for adults

Example 2 Frame-fork assembly for bicycles Motor assist cycle City-cycle

13 Marking

Markings on the frame-fork assembly shall be as follows:

a) The frame-fork assembly shall be marked with the following items in an indelible way by means of engraving, thermal transfer printing, nameplate, sticker, etc. at a conspicuous place such as the bottom part of a bottom bracket shell or the bottom bracket surface.

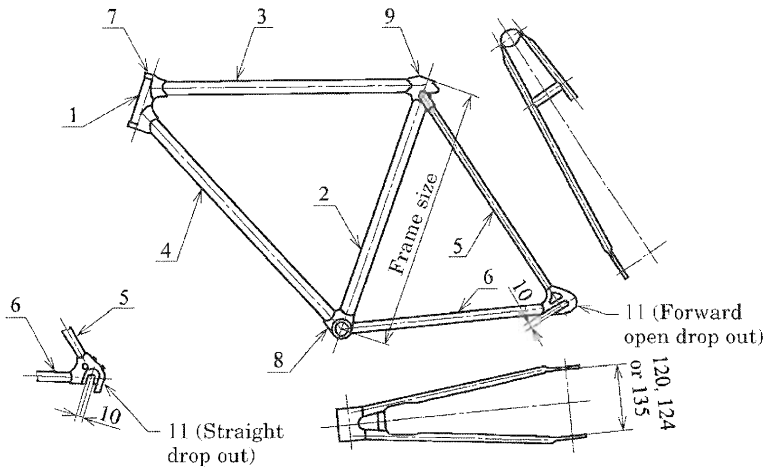
1) Manufacturer's name or its abbreviation

2) Year and month of manufacture or their abbreviation

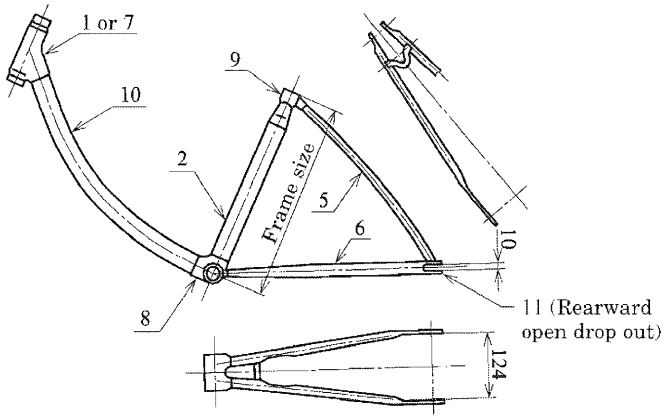
3) Vehicle identification number

b) The seat pillar shall be marked indelibly with a limit mark signifying the minimum insertion depth into the frame. The minimum insertion mark shall be located at a portion not less than two diameters of the pillar from the bottom of the pillar, and not affect the strength of the pillar.

Unit: mm



a) **Diamond-shaped**

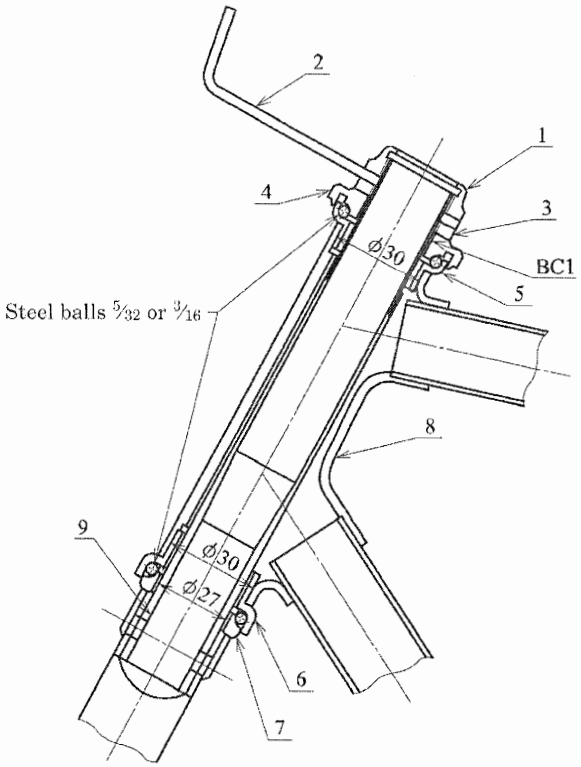


b) **Other than diamond-shaped**

No.	Name of part
1	Head tube
2	Seat tube
3	Top tube
4	Down tube
5	Seat stay
6	Chain stay
7	Head lug
8	Bottom bracket shell
9	Seat lug
10	Main tube
11	Rear fork end

Figure 19 Frame

Unit: mm



No.	Name of part	
1	Head lock nut	Head set
2	Spacing key washer [a)]	
3	Head plain lock nut	
4	Head cone	
5	Upper head cup	
6	Lower head cup	
7	Crown race	
8	Head lug	
9	Fork stem	

Note [a)] Lamp bracket and basket bracket are included.

Figure 20 Head assembly and head set

Unit: mm

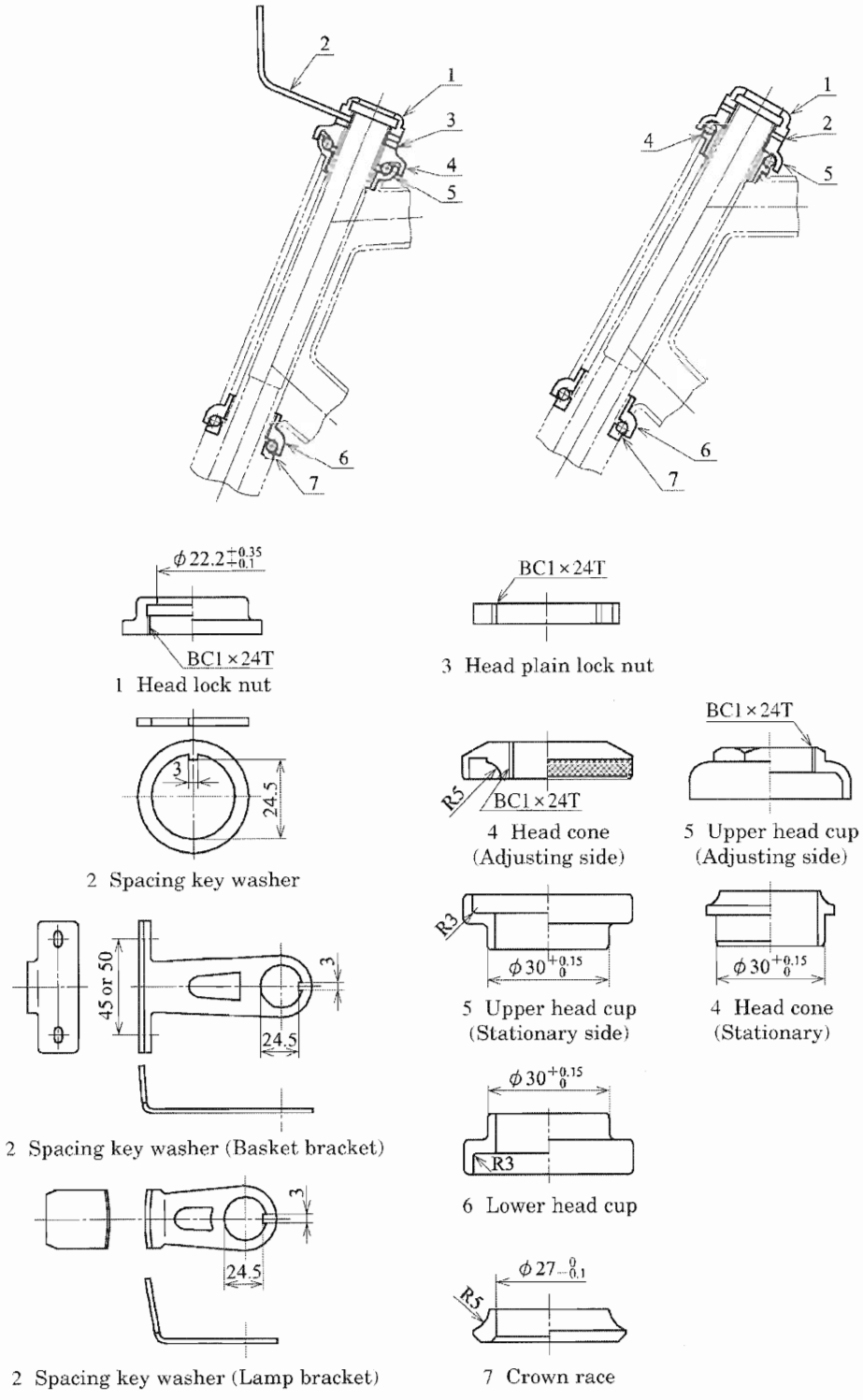
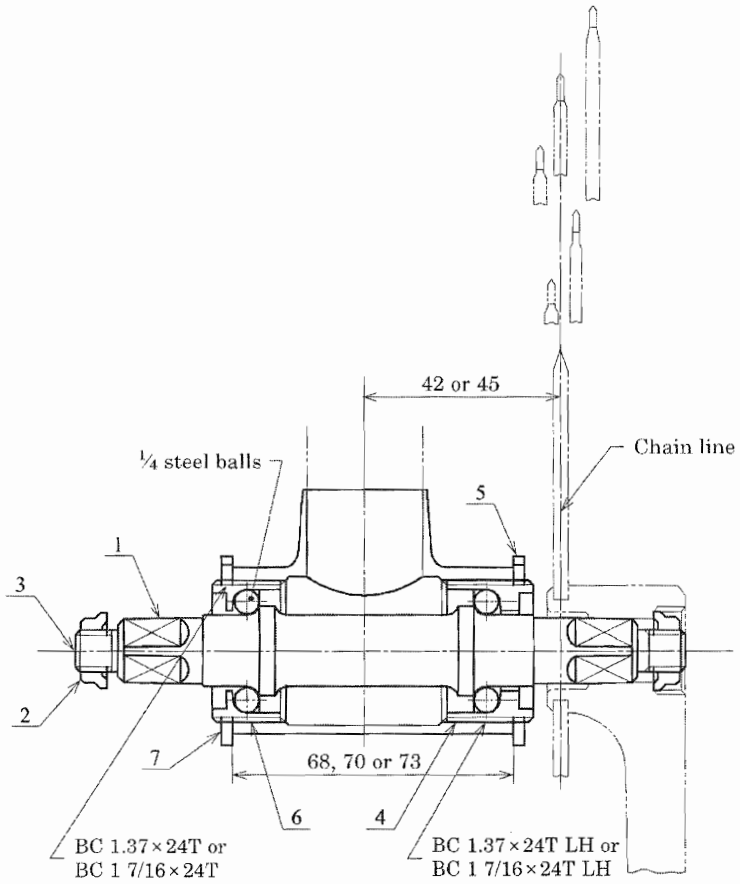
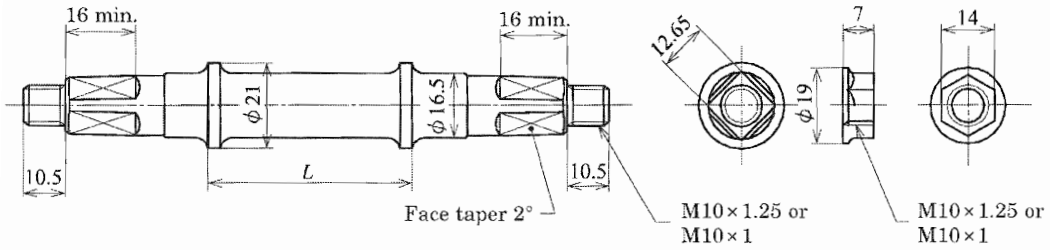


Figure 20 (concluded)

Unit: mm



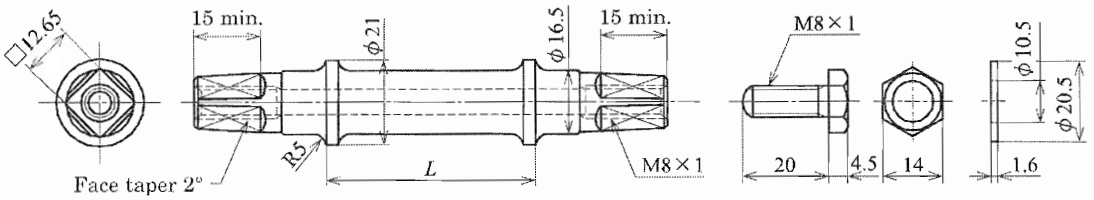
No.	Name of part	
1	Bottom bracket spindle	Bottom bracket parts
2	Crank retaining nut	
3	Crank retaining bolt	
4	Bottom bracket fixed cup	
5	Chain guard fixing nut	
6	Bottom bracket adjusting cup	
7	Bottom bracket cup lock ring	



1 Bottom bracket spindle (nut fixing type) 2 Crank retaining bolt

Figure 21 Bottom bracket parts

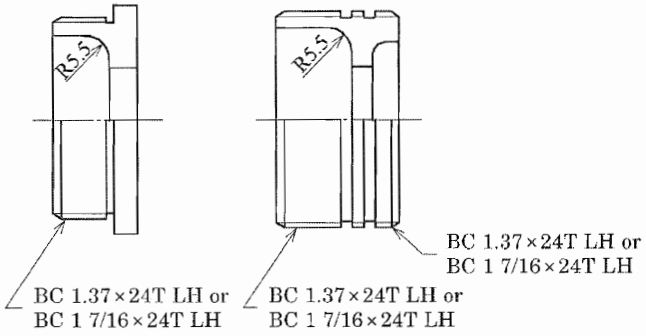
Unit: mm



Width of bottom bracket shell	Dimension L
68	52
70	52
73	55

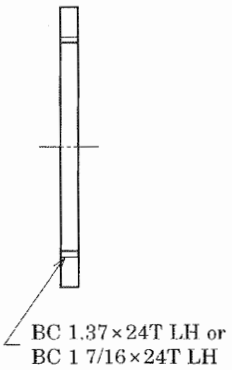
1 Bottom bracket spindle (nut fixing type)

3 Crank retaining bolt

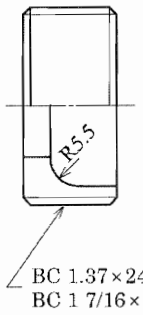


(Chain guard attaching type)

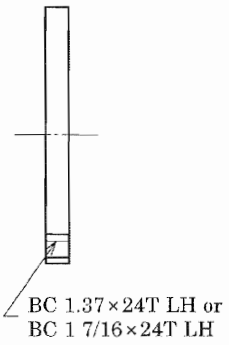
4 Bottom bracket fixed cup



5 Chain guard fixing nut



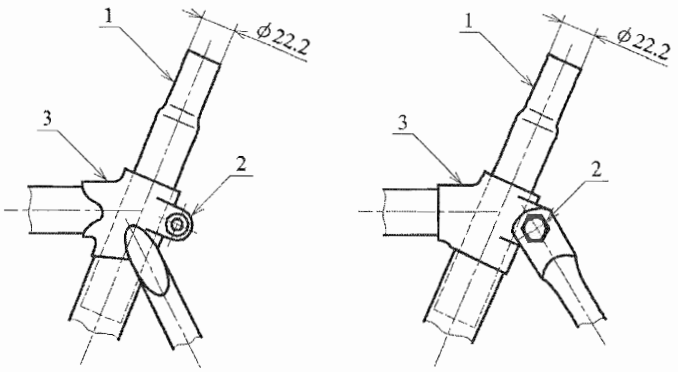
6 Bottom bracket adjusting cup



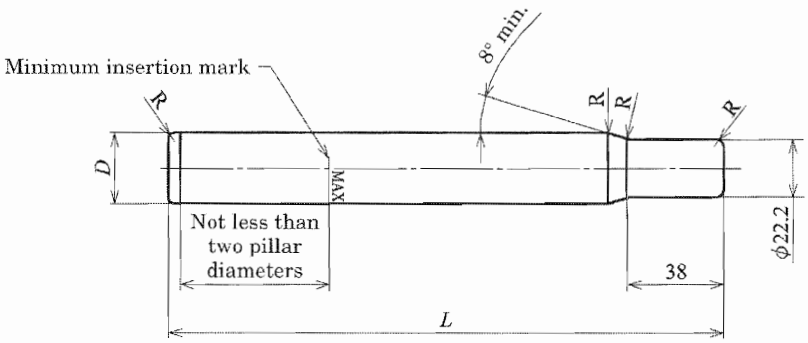
7 Bottom bracket cup lock ring

Figure 21 (concluded)

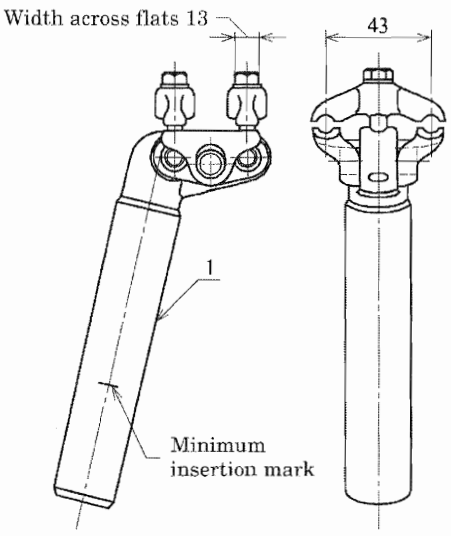
Unit: mm



No.	Name of part	
1	Seat pillar	Seat parts
2	Seat clamp bolt	
3	Seat lug	



a) Straight seat pillar

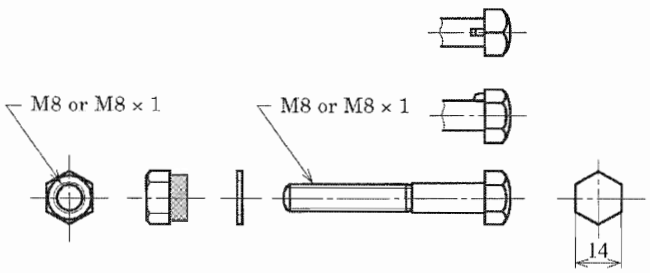


b) Saddle clamp combined seat pillar

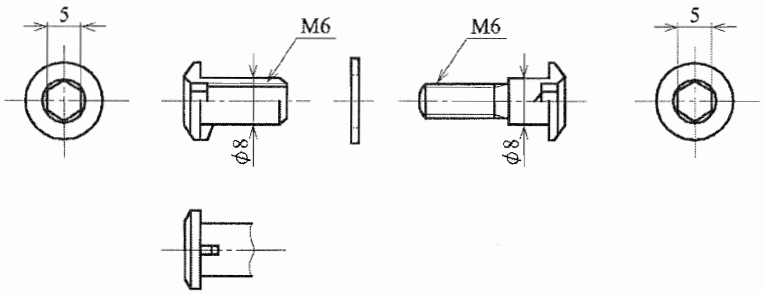
1 Seat pillar

Figure 22 Seat assembly and seat parts

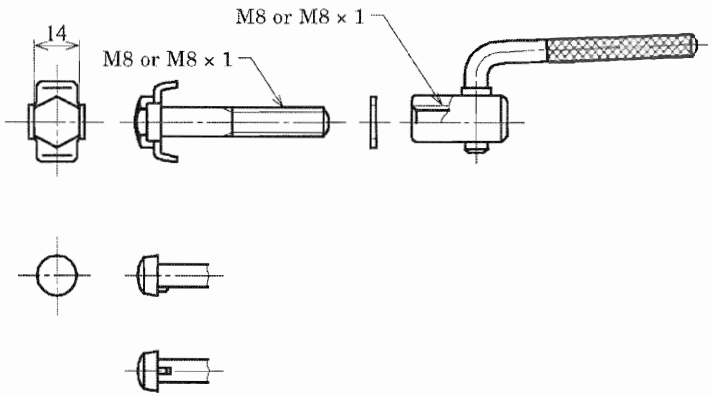
Unit: mm



c) 2 seat clamp bolt



d) 2 seat clamp bolt (hexagon socket head type)



e) 2 seat clamp bolt (levered)

Figure 22 (concluded)

Bibliography

JIS D 9301 *Bicycles for general use*

JIS D 9302 *Bicycles for young children*

Errata for JIS (English edition) are printed in *Standardization and Quality Control*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

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